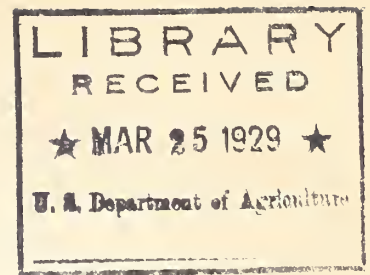


Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

1.9
P69Ba-Hu
1928



ANNUAL REPORT OF THE BARBERRY ERADICATION CAMPAIGN, 1928,

WITH SUMMARIZED RESULTS FOR 1918-1928, INCLUSIVE.

Office of Cereal Crops and Diseases,

Bureau of Plant Industry

U. S. Department of Agriculture

Washington, D. C.

February, 1929.

NOT FOR PUBLICATION

INDEX

	<u>Page</u>
Introduction - - - - -	1
Organization and Finances - - - - -	1
Surveys - - - - -	2
First Survey - - - - -	2
Resurveys - - - - -	3
Second Survey - - - - -	3
Combined Resurvey and Second Survey - - - - -	4
Eradication - - - - -	4
Escaped Barberries and Seedlings - - - - -	4
Investigations - - - - -	5
Stem Rust Epidemiology Studies - - - - -	5
Wheat Rust - - - - -	5
Oat Rust - - - - -	7
Rust from Barberries - - - - -	8
Classification of Barberry Species, Varieties, and Hybrids - - - - -	10
Inoculation of Barberry Species, Varieties, and Hybrids with Stem Rust - - - - -	10
Publicity and Educational Activities - - - - -	10
Publicity and Educational Materials Distributed, 1928 - - - - -	12
Publicity and Educational Materials Distributed, 1918-1928 - - - - -	13
Summarized Results - - - - -	14
Summary for 1928 - - - - -	14
Summarized Results from 1918 to 1928, Inclusive - - - - -	14
Tables:	
1. First Survey, Properties, Jan. 1 to Dec. 31, 1928 - - - - -	16
2. First Survey, Bushes and Seedlings, Jan. 1 to Dec. 31, 1928 - - - - -	17
3. First Survey, Properties, April 1, 1918, to Dec. 31, 1928 - - - - -	18
4. First Survey, Bushes and Seedlings, April 1, 1918, to Dec. 31, 1928 - - - - -	19
5. Second Survey, Properties, Jan. 1 to Dec. 31, 1928 - - - - -	20
6. Second Survey, Bushes and Seedlings, Jan. 1 to Dec. 31, 1928 - - - - -	21
7. Second Survey, Properties, Jan. 1, 1922, to Dec. 31, 1928 - - - - -	22
8. Second Survey, Bushes and Seedlings, Jan. 1, 1922, to Dec. 31, 1928 - - - - -	23
9. Resurvey, Properties, Jan. 1 to Dec. 31, 1928 - - - - -	24
10. Resurvey, Sprouting Bushes and Seedlings, Jan. 1 to Dec. 31, 1928 - - - - -	25
11. Resurvey, Properties, April 1, 1918, to Dec. 31, 1928 - - - - -	26
12. Resurvey, Sprouting Bushes and Seedlings, Apr. 1, 1918, to Dec. 31, 1928 - - - - -	27
13. Eradication, 1928 - - - - -	28
14. Eradication, 1918 to 1928 - - - - -	29
15. Chemicals, Quantities Used, Jan. 1 to Dec. 31, 1928 - - - - -	30
16. Chemicals, Quantities Used, Sept. 1, 1921, to Dec. 31, 1928 - - - - -	31
17. Grand Summary, Original Bushes, Sprouting Bushes, and Seedlings, Jan. 1 to Dec. 31, 1928 - - - - -	32
18. Grand Summary, Original Bushes, Sprouting Bushes, and Seedlings, 1918-1928 - - - - -	33
19. Grand Summary by Years, Original Bushes, Sprouting Bushes, and Seedlings, 1918 to 1928 - - - - -	34
Maps:	
Numbers of Barberry Bushes and Seedlings Destroyed, 1918-1928 - - - - -	35
Rural Properties on Which All Barberry Bushes Were Found, All Surveys, 1928 - - - - -	36
Cities in Which Common Barberry Bushes Were Found, All Surveys, 1928 - - - - -	37
Rural Properties on Which Barberry Bushes Were Found, All Surveys, 1918-1928 - - - - -	38
Cities in Which Barberry Bushes Were Found, All Surveys, 1918-1928 - - - - -	39
Rural Properties on Which Escaped Barberry Bushes Were Found, All Surveys, 1918-1928 - - - - -	40
Rural Properties on Which and Cities in Which Barberry Seedlings Were Found, All Surveys, 1918-1928 - - - - -	41

REPORT OF PROGRESS IN BARBERRY ERADICATION FOR THE CALENDAR
YEAR ENDED DECEMBER 31, 1928

By Lynn D. Hutton, Associate Pathologist in Charge, and
Hugh E. Clark, Clerk

INTRODUCTION

On December 31, 1928, the eleventh year of the barberry-eradication campaign was concluded. During 1928, new and improved methods of survey and eradication were adopted and have proved successful. Continued publicity and educational activities have resulted in a closer cooperation of property owners. More comprehensive data on the occurrence and spread of stem rust have been added. Additional information has been secured relative to the distribution, viability, and longevity of barberry seeds.

Two important conferences in 1928 resulted in a greater solidarity and unity of the campaign as a whole. The first of these was the annual conference, which was held at the Nebraska College of Agriculture, Lincoln, Nebr., from March 19 to 24, inclusive. At this conference the problems and progress of the first ten years of barberry eradication were reviewed in detail, and a comprehensive future program was discussed and determined upon. The second conference was combined with a field trip through eastern Nebraska, Iowa, northwestern Illinois, southwestern Wisconsin, Minnesota, South Dakota, and North Dakota. This conference was held August 6 to 19, inclusive. As a result of this conference and field trip actual survey and eradication operations were studied simultaneously by the State Leaders, and joint determinations were made as to the best survey and eradication methods in comparable areas in all of the barberry-eradication States.

ORGANIZATION AND FINANCES

The barberry-eradication campaign is conducted by the Office of Cereal Crops and Diseases, Bureau of Plant Industry, U. S. Department of Agriculture, in cooperation with the State colleges of agriculture, the State departments of agriculture, and other agencies, in the 13 States of Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming.

Enough of the funds for the campaign appropriated for the fiscal year beginning July 1, 1927, was reserved to finance adequately the spring activities in 1928. Therefore, the progress made during 1928 represents approximately the progress possible under the appropriation of one fiscal year. This amount includes a Federal appropriation of \$375,000 and approximately \$82,000 in aid furnished by the States and other cooperating agencies.

As heretofore, the activities of the campaign were directed along the four major lines, (1) surveys, (2) eradication, (3) investigations, and (4) publicity and education.

SURVEYS

During the year a new system of survey was evolved and successfully put into practice. This new system increases the size of the field squad from four to six men, one of whom is the squad leader. The squad leader is in immediate charge of his squad and is directly responsible for its method of contact, thoroughness of survey, and completeness of eradication. The squad leader does not work in line with his men as heretofore, but follows the squad and continually checks upon the efficiency of each man, as well as of the squad as a unit. The squad leader also deploys his men as the circumstances demand in the various types of territory. This method, or some approved modification of it, was used in 1928 in the first and second survey in each of the States with a resulting increase in survey efficiency.

Four orders of survey were carried on during the year. These were (1) first survey, (2) resurvey, (3) second survey, and (4) combined resurvey and second survey.

First Survey

At the beginning of the year some counties remained in Illinois, Michigan, Montana, and Ohio which had not yet been covered by a first survey for barberries. The counties which it seemed necessary to cover by first survey in the other nine States were completed before 1925. During the year 10.53 counties were surveyed for the first time. These included 3.0 counties in Illinois, 0.62 counties in Michigan, 6.30 counties in Montana, and 0.61 counties in Ohio. During the year 1,405,660 bushes and seedlings were found on 547 properties in this first survey.

The first survey now is completed in Montana. The following numbers of counties remain to be completed in the other three States: Illinois, 22 counties; Michigan, the equivalent of 7 counties; and Ohio, 0.2 of one county.

Resurveys

Resurveys of properties upon which bushes and seedlings previously had been found and destroyed were made in approximately 14.5 counties in 1928. Resurveys were limited to those counties in which it was believed fruiting bushes had appeared since the previous survey and which would be a source of seed distribution before the next complete survey could be carried on. Every effort was made to minimize the amount of resurvey in order to make available a larger percentage of the appropriation for furthering the intensive surveys. In 1928, 4,522 sprouting bushes and 26,920 seedlings were destroyed on 195 properties on the resurveys. During the entire campaign 317,225 sprouting bushes and 3,006,903 seedlings have been found on 14,112 properties on resurveys.

Second Survey

A second survey is being carried on in each of the States. The second survey is made to find bushes which may have escaped observation on the first survey, bushes which have grown from seed since the first survey, and new planted bushes which may have been brought in from States outside of the eradication area. Because of its intensive nature, progress of the second survey is much slower than that of the first survey in the same counties. It is believed that this intensive survey definitely will clean up many large areas so that additional complete surveys will not be necessary. On the other hand, in heavily infested areas the second survey will not completely eliminate all of the bushes and subsequent complete surveys and resurveys will be necessary.

In 1928, approximately 15 counties were covered in the second survey. A total of 249.5 counties has been covered by the second survey during the entire campaign. A total of 91,972 original bushes and seedlings was found on 595 properties on second survey in 1928. Since the beginning of the second survey in 1922, 564,112 original bushes and seedlings have been found on 5,132 properties.

Combined Resurvey and Second Survey

Whenever possible the resurvey activity in a county is delayed until it can be combined with the more complete and intensive second survey. The combining of these two activities depends upon the length of time that the known properties can be left without a reinspection, in view of the danger of sprouting bushes producing fruit or starting destructive stem-rust epidemics. The combination of these two activities whenever possible has materially reduced individual resurveys and has resulted in a true economy of operation.

ERADICATION

A still greater percentage of barberry bushes and seedlings were killed with salt and kerosene this year than ever before. Although other chemicals were tested for this purpose during the year, none was found to be as effective, cheap, and easy to obtain and apply as these two.

In the calendar year 1928, more than 331 tons of salt and 1,359 gallons of kerosene were used to destroy 1,499,765 original bushes, sprouting bushes, and seedlings on 1,097 properties, whereas 21,067 original bushes, sprouting bushes, and seedlings were dug or pulled from 553 properties. The total number eradicated by all methods during the year was 1,520,832 bushes, sprouting bushes, and seedlings.

The effectiveness of salt and kerosene as agents for killing the barberry is well exemplified by the following figures:

In 1923, before the results of chemical eradication were included in the resurvey reports, 106,700 sprouting bushes were found. The comparable figure for each year has been materially less, although equally as many previously destroyed bushes were inspected on the resurveys. In 1928, only 4,522 sprouting bushes were found. A very great majority of the bushes from which these sprouts had grown never had been treated with chemicals, but had been dug.

Escaped Barberries and Seedlings

One of the principal difficulties in complete eradication of all barberries is the finding and destroying of the bushes that have grown from scattered seeds. Seeds from thousands of old fruiting bushes have been scattered to adjacent properties, so that numerous areas now exist in which escaped barberries and seedlings are growing under conditions that make complete eradication extremely difficult.

In 1928, a definite attempt was made to eradicate all of the bushes and seedlings from some of the larger areas so that further seed spread in those areas will not be possible. Foot-by-foot surveys were carried on in all such areas of escaped bushes. The survey in each area was extended to at least two miles beyond the limits of the last fruiting escaped bush, in order to insure that the outer edges of the area were found. By this method of preventing bushes from fruiting, the further spread of barberries is being prevented. By additional surveys at 5-year intervals all of the bushes produced from seeds now lying in the ground eventually will be destroyed, and the areas will be cleared of bushes. During the year a grand total of 1,510,527 escaped bushes and seedlings was destroyed. This is approximately 99 per cent of the total number of bushes destroyed during the year. The figures show how proportionately important the escaped-bush problem is.

INVESTIGATIONS

The three investigational phases of the barberry eradication campaign previously carried on were continued during 1928. These are: (1) stem-rust epidemiology studies, (2) classification of barberry species, varieties, and hybrids, and (3) the inoculation of barberry species, varieties, and hybrids with stem rust.

Stem Rust Epidemiology Studies

In 1928, under the supervision of Dr. E. C. Stakman,^{1/} University Farm, St. Paul, Minn., the stem-rust epidemiology studies again were carried forward under three general divisions. (1) A study of the development of rust during the growing season, (2) controlled experiments on the effect of temperature on the development of rust, and (3) a historical study of the relation between weather and the development of rust epidemics. Following is Dr. Stakman's report on these activities:

^{1/}The following persons were engaged in the study during all or part of the season: Dr. E. C. Stakman, Dr. E. B. Lambert, Dr. H. B. Humphrey, Mr. J. M. Wallace, Mr. Wallace Butler, Mr. H. H. Thornberry, and Dr. J. J. Christensen. In addition, the members of the regular rust investigational staff, certain other members of the Office of Cereal Crops and Diseases, and the State Leaders of barberry eradication cooperated closely and furnished much very valuable information.

"In studying the development of rust during the growing season in 1928, an attempt was made to find out, first of all, the source of rust. For this reason a study again was made of the overwintering of the uredinial stage of the rust, of the possible northward migration of rust from the Far South, and of the development of local and regional epidemics from barberries. As stem rust does by far its greatest damage in the hard-spring wheat area, an attempt was made especially to find out the relative amount of rust due to urediniospores blown into that region from the south and that due to aeciospores from barberries within the region, as well as from barberries immediately surrounding the region.

"It was perfectly evident that little if any rust overwintered in the uredinial stage, even in southern Texas. As a matter of fact there was no evidence whatever that the uredinial stage of Puccinia graminis tritici overwintered on wheat in Texas, and only one case of overwintering of P. graminis avenae (on oats) was observed there. No rust could be found on wheat in Texas during the winter. A small amount appeared early in March under circumstances which suggested strongly that it had been blown in from farther south, probably Mexico. Owing to the dry weather, the rust apparently disappeared later in the month and reappeared about the middle of April. From that time on it developed with moderate rapidity, although, in general, relatively little was produced.

"Two methods were used in an attempt to find out whether the rust was blown northward from Texas early enough and in sufficient quantity to account for the rust which developed farther north: (1) direct observations on the development of rust from south to north, and (2) physiologic-form surveys of P. graminis tritici and P. graminis avenae."

Wheat Rust

"There was a gradual extension of the rust from the south to the north, but this migration was late and slow. Stem rust appeared on wheat in Kansas and Nebraska from 10 to 14 days later than it usually does. It was first found in the spring-wheat area about June 20, but it was very scarce until the first week of July. While there was some direct evidence, therefore, that the rust gradually extended from the south to the north, it is perfectly clear that it came too late and in too small quantities to do much damage. Even if considerable quantities of rust had been blown northward early in the season, there is evidence that it would not have caused much damage.

"The forms of P. graminis tritici which predominated in Mexico, Texas, and Oklahoma in 1928 normally can not infect most of the hard winter wheats and the hard spring wheats. Approximately 600 collections of rusted wheat from Mexico and the United States have been tested so far. Of these, about 300 have been identified. There was so little rust on many of the collections that it was not possible to determine the physiologic forms present. From the results so far obtained, however, it is perfectly evident that form 38 of P. graminis tritici was by far the most prevalent form in Mexico and southern United States. This form can not cause heavy infection on many hard winter wheats. Marquis and most of the other hard spring wheats are resistant to it, and its effect on the durumms is variable. It made its way into the hard-winter and spring-wheat areas also but could not develop rapidly and destructively because of its inability to attack normally most of the varieties grown in those regions. The results are significant for two reasons, first, because they show that the forms of rust which may be blown from the south to the north in considerable quantity in some seasons may not be dangerous for the varieties of wheat grown in the north. Furthermore, it seems probable that a physiologic-form survey in the Far South early in the season will make possible a prediction as to the probable development of rust in the north, especially after most of the barberries are eradicated."

Oat Rust

"An extensive physiologic-form survey also was made of P. graminis avenae, and about 300 collections have been identified. Forms 2 and 5 only were found, and they were so universally distributed that the survey did not contribute directly to an interpretation of the rust situation this year.

"It is perfectly evident, then, that rust did not overwinter to any extent in Texas, that which did develop there apparently having been blown in from Mexico. This rust spread gradually northward but late enough in the spring so that it probably did not do much damage farther north. Furthermore, it is very significant that even had this rust been blown northward earlier in the season it probably would have done but little damage because of the fact that the physiologic forms which were blown northward could not infect the oat varieties grown in the north."

Rust from Barberries

"An attempt also was made to find out whether the rust from barberry bushes in Missouri, Kansas, northeastern Iowa, southwestern Wisconsin, and southeastern Minnesota developed early enough and in sufficient quantity to furnish abundant inoculum for the infection of grains and grasses in the spring wheat area. A large number of barberry bushes were examined in these different areas. It was quite evident, however, that, under the conditions prevailing in 1928, they were not responsible for the development of much rust farther north. Barberries were rusted as far south as McPherson, Kans., and Union, Mo., but, in general, they became infected later than usual. The first observed cases of the development of rust near barberries were in Iowa and Kansas on June 9. While local epidemics developed later in quite a number of cases near bushes, it was evident that these epidemics extended over rather small areas. Furthermore, most of the rust in these areas proved to be of the Secalis and Agrostis varieties, and would therefore not infect wheat and oats farther north.

"Within the barberry-eradication area some destructive local epidemics of rust developed near barberries, even though the bushes became rusted later than usual. In the southeastern section of the area, where the bushes usually become infected between the middle of April and the first of May, the aecia did not mature this year until the first or second week in May. In the more northern States mature aecia were not found until late in May. The rust began to spread from the bushes to grains and grasses correspondingly late. Nevertheless some very interesting situations developed. Some of the outstanding cases of the development of local epidemics near bushes were observed in Grant County, S. Dak.; near Reynolds, Grand Fork County, N. Dak.; Nicollet County, Minn.; at several places in Iowa, and in the Black Earth district of Wisconsin. Probably the most significant cases were those in Grant County, S. Dak., near Reynolds, N. Dak., and in Nicollet County, Minn. There was evidence that regional epidemics developed from the bushes at these places. There is, as a matter of fact, some circumstantial evidence that the rather heavy infestation of rust in west-central Minnesota may have been attributable to the spread of rust from barberries in the Grant County area of South Dakota. A fairly careful study was made of the epidemic near Reynolds, N. Dak., but the observations were made too late to get conclusive evidence on the exact distance to which the epidemic extended from the bushes. The spread from the bushes was well defined for a distance of 14 miles. A distinct regional epidemic spread from bushes in Nicollet County, Minn. Weather conditions were not particularly favorable for rust this year. Nevertheless many local and some regional epidemics occurred near barberry bushes. This is indicative of what would have happened had the millions of barberry bushes already eradicated not been removed, and it indicates also what would happen were the barberry bushes still here permitted to remain and multiply. It is highly significant also that the physiologic forms of P. graminis tritici isolated from barberries were more virulent than were those isolated from most of the collections from the south.

"A study of the relation of weather to the development of rust in 1928 reveals the following facts: The weather was not particularly favorable for overwintering of the uredinial stage of rust in the south nor for its development in the spring. There was relatively little rainfall in much of the barberry-eradication area in May, and barberries therefore did not become so heavily infected as they often do. This dry weather undoubtedly reduced the amount of inoculum by reducing the number of aeciospores on barberries and by preventing the aeciospores from infecting grains and grasses early in the season. The month of June was exceptionally cold, and the rust therefore could not develop rapidly. While the average temperature for July was slightly below normal in much of the hard red spring-wheat area, the weather conditions during most of the growing season in this month were favorable for rust development. Relatively little rust developed, however, because of the fact that it got a late start in the spring, both because of the relatively small amount blown up from the south and the comparatively light infection of barberries in many regions, and because of unfavorable conditions for rust development during June. Furthermore, as previously mentioned, most of the rust which apparently was blown up from the south was not able to attack normally the varieties of hard wheats grown farther north.

"A study was made, under controlled conditions, of the effect of temperature on infection and incubation of stem rust and certain leaf rusts. Some important results have been obtained, but further work must be done before final conclusions can be drawn.

"A historical study was made of the relation between temperature in the spring-wheat area and the development of rust epidemics. It was found that there is a tendency for epidemics to develop in years when the temperatures are above normal during the growing season, and vice versa. It is evident, however, that precipitation also is an important factor, and the conclusions with respect to the effect of temperature are valid only on the assumption that there is sufficient precipitation for rust development. A preliminary paper^{2/} and a more detailed report^{3/} embodying these results have been published."

^{2/}Stakman, E. C., and E. B. Lambert. The relation of temperature during the growing season in the spring wheat area of the United States to the occurrence of stem rust epidemics. *Phytopath.* 18 (4): 369-374. 1928.

^{3/}Lambert, E. B. The relation of weather to the development of stem rust in the Mississippi Valley. *Phytopath.* 19 (1): 1-71. 1929.

Classification of Barberry Species, Varieties, and Hybrids

In 1928, under the supervision of Mr. B. Y. Morrison, Senior Horticulturist, additional species, varieties, and hybrids of barberries have been assembled, grown, and studied at Bell, Maryland, the U. S. Plant Field Station. The *Berberis* collection at Bell now includes most of the barberry species and varieties that are grown or are likely to be grown in the United States. Descriptions, as well as actual herbarium specimens of these bushes, are being obtained and furnished to the State Leaders in barberry eradication to assist them in identifying undetermined bushes found in the progress of the surveys.

Inoculation of Barberry Species, Varieties, and Hybrids, with Stem Rust

In 1928, Mr. Ralph U. Cotter, Agent, University Farm, St. Paul, Minn., inoculated 63 species and varieties of *Berberis* with four varieties of *Puccinia graminis*. Mr. Cotter's report of this work is as follows:

"In the trials of 16 of these, the checks did not become infected, leaving 47 species and varieties upon which data are available. Infection occurred upon the checks of the series in which 24 species or varieties were included, but not upon the plants tested. Twenty-three of the species and varieties inoculated became infected in addition to the check, the infection ranging from very light to very heavy.

"No new species were added to the list of susceptible species, but one variety, *B. wilsonae* 'Autumn Cheer,' was found to be susceptible. Those uninfected species which were included in series of which the check was infected are: *B. insignis*, *B. gilgiana*, *B. edgeworthiana*, *B. bergmanniana*, *B. circumserrata*, and *B. californica*. (The latter species has compound leaves but is called *Berberis*, following the nomenclature of Blake.) The trials of these species range from one to six in number but are considered too few to justify placing them in the immune class at the present time."

PUBLICITY AND EDUCATIONAL ACTIVITIES

Undoubtedly more emphasis was given to the publicity and educational activities during 1928 than in any previous year of the campaign. On May 1, 1928, Mr. John L. Richardson was appointed Agent in charge of field publicity activities. Through the combined efforts of Mr. Richardson, Mr. Donald G. Fletcher, Secretary of The Conference for the Prevention of Grain Rust, Mr. G. D. George, who is in charge of State Fair demonstrations, and the State Leaders of barberry eradication, the publicity program for the year was carried out far better, and, in addition, a long-time program has been outlined.

In the year 82 news articles were prepared for distribution through the college press association at the various agricultural colleges, 46 articles were released through nation-wide press associations, including the U. S. Department of Agriculture Press Service, 1,253 articles were given to individual newspapers, and 53 long articles were published in farm papers. Window displays were placed in 327 post offices, banks, county agent offices, and stores. Seventy-nine fair demonstrations, 41 roadside demonstrations, 38 street demonstrations, 2 school demonstrations, and 3 demonstrations at festivals were erected during the year. Seventeen demonstrations were made of the spread of stem rust from barberries to nearby grains and grasses. The lantern slide series, "The Common Barberry and Black Stem Rust," was shown 200 times, and the barberry-eradication motion picture, 49 times. A total of 21 radio broadcasts was made. Speakers from within the organization talked at 188 schools, 144 farm meetings, 38 meetings of business men, 23 luncheon club meetings, and 40 other meetings.

The educational activities through schools and other organizations also were analyzed and improved. More suitable lesson plans, teachers' guides, laboratory exercises, and study materials have been prepared during the year. A closer cooperation has been established with the State superintendents of public instruction, the county superintendents of schools, city superintendents of schools, and the teachers themselves.

Lesson plans, bulletins, specimens, and other study materials were furnished to 28,861 grade schools in the eradication area during the year. Similar types of information prepared for the use of more mature students were sent to nearly every high school, and to over half of the universities, colleges, and normal schools in the area. Literature and specimens also were furnished to Boys and Girls Clubs, and similar organizations in each State.

In 1928, the U. S. Department of Agriculture distributed 624,909 copies of bulletins, circulars, lesson plans, circular letters, and other pieces of printed matter in furthering the publicity and educational activities. The Conference for the Prevention of Grain Rust printed and distributed 538,502 pieces of printed matter, and the cooperating States 57,677 pieces. This makes a total of 1,221,088 pieces distributed by all three agencies in 1928. As a result of the improved and increased publicity and educational matter, more complete public cooperation was obtained than ever before.

Following is a summary of the publicity and educational materials furnished and distributed by the U. S. Department of Agriculture, The Conference for the Prevention of Grain Rust, and the 13 cooperating States during the period from January 1 to December 31, 1928. A second table shows the comparable figures for the period from the beginning of the campaign to December 31, 1928.

Publicity and educational matter furnished and distributed by the U. S. Department of Agriculture, The Conference for the Prevention of Grain Rust, and the 13 cooperating States, in furthering the Barberry Eradication Campaign in the period from January 1, to December 31, 1928, inclusive

Kind of Material	: :U. S. D. A.: :	: :Conference: :	: :States: :	: :Totals :
Bulletins and Circulars	322,909	15,296	54,677	392,882
Multigraphed State Annual Reports	9,300	---	---	9,300
Posters	100	---	3,000	3,100
Colored Plates	---	139,551	---	139,551
Rust Loss Statements	---	25,000	---	25,000
Lesson Plans	47,000	---	---	47,000
Lesson Plan Covers	---	6,000	---	6,000
Laboratory Outlines	---	29,369	---	29,369
Microscope Slides (Sets of 3) ^{a/}	---	3,229	---	3,229
Envelopes for Grain Samples	40,000	---	---	40,000
Rusted Straw Specimen Cards	35,000	---	---	35,000
Barberry Specimen Envelopes ^{a/}	---	66,401	---	66,401
Life Cycle Models (Sets)	---	1	---	1
School Display Sets	---	60	---	60
Mimeographed Radio Talks	1,000	---	---	1,000
Circular Letters	111,100	---	---	111,100
Return Cards	6,500	42,875	---	49,375
Maps (Rotaprinted)	19,000	---	---	19,000
Reprint of Newspaper Articles	---	62,213	---	62,213
Hang-Me-Up Cards	15,000	---	---	15,000
Calendar Cards	---	40,202	---	40,202
Warning Blotters	---	78,023	---	78,023
Miscellaneous	18,000	30,282	---	48,282
Totals	624,909	533,502	57,677	1,221,088

^{a/} U.S.D.A. and Conference, cooperatively.

Publicity and educational matter furnished and distributed by the U. S. Department of Agriculture, The Conference for the Prevention of Grain Rust, and the 13 cooperating States, in furthering the Barberry Eradication Campaign in the period from April 1, 1918, to December 31, 1928, inclusive

Kind of Material	U.S.D.A.	Conference	States	Totals
Bulletins and Circulars	2,055,909	1,182,966	566,047	3,804,922
Multigraphed State Annual Reports	9,300	---	---	9,300
Posters	350,355	189,205	3,000	542,560
Colored Plates	20,000	715,368	---	735,368
Rust Loss Statements	---	298,648	---	298,648
Lesson Plans	114,000	---	---	114,000
Lesson Plan Covers	---	6,000	---	6,000
Laboratory Outlines	---	29,369	---	29,369
Microscope Slides (Sets of 3) ^{a/}	---	3,229	---	3,229
Envelopes for Grain Samples	40,000	---	---	40,000
Rusted Straw Specimen Cards	60,000	---	---	60,000
Barberry Specimen Envelopes ^{a/}	---	216,587	---	216,587
Life Cycle Models (Sets)	---	1	---	1
School Display Sets	---	60	---	60
Mimeographed Circulars	3,000	---	---	3,000
Mimeographed Radio Talks	17,000	---	---	17,000
Circular Letters	277,600	150,695	---	428,295
Return Cards	39,500	353,075	---	392,575
Maps (Rotaprinted)	19,000	---	---	19,000
Reprints of Newspaper Articles	---	85,563	---	85,563
Hang-Me-Up Cards	30,000	---	---	30,000
Cross Word Puzzle	---	3,000	---	3,000
Dodgers	---	72,350	---	72,350
Calendar Cards	---	100,202	---	100,202
Official Personnel Lists, etc.	---	48,500	---	48,500
Warning Blotters	---	78,023	---	78,023
Miscellaneous	18,000	184,802	---	202,802
Totals	3,053,664	3,717,643	569,047	7,340,354

^{a/} U.S.D.A. and Conference, cooperatively.

SUMMARIZED RESULTS

Summary for 1928

During the calendar year 1928 approximately 10.5 counties were covered in the first survey, and approximately 15 counties were surveyed a second time. In continuing the resurvey approximately 14.5 counties were covered. Original bushes numbering 111,464 were found on 1,302 properties and 112,080 original bushes were destroyed on 1,395 properties in all surveys during the year. These totals include 48,217 bushes found on 595 properties in second survey. In the resurvey 4,522 sprouting bushes were found and 4,522 were destroyed. A total of 1,403,830 seedlings was found and a total of 1,404,230 seedlings was destroyed in the first survey, second survey, and resurveys. A grand total of 1,519,816 original bushes, sprouting bushes, and seedlings was found and a grand total of 1,520,832 was destroyed. The figures showing the numbers destroyed include some original bushes and seedlings found in previous years but not destroyed until 1928.

Summarized Results from April 1, 1918, to December 31, 1928, Inclusive

In the 10 years of the campaign from April 1, 1918, to December 31, 1928, an area equivalent to approximately 892 counties has been covered in the first survey of cities, towns, and farmsteads. Approximately 29 relatively unimportant counties remain to be surveyed a first time. These counties are in the southern part of Illinois and in the northern peninsula of Michigan. The first survey of nearly all cities, towns, and villages in the entire 13 States has been completed.

Approximately 249.5 counties, of the counties covered by first survey, have been surveyed a second time. These comprise about 27 per cent of the total number of counties that ultimately will be covered by the first survey. Resurveys of infested locations in most of the counties covered by the first or second survey to June 30, 1925, have been made to destroy all sprouts or seedlings which have appeared since eradication.

Original bushes numbering 7,024,333 have been located on 78,259 properties in all three surveys. Of these 7,022,533 bushes have been destroyed on 78,208 properties.

In resurvey 317,225 sprouting bushes were found on 14,112 properties. Of these, 316,963 have been destroyed. In all surveys, 10,250,666 seedlings were found and 10,247,730 were destroyed. These numbers include 236,278 bushes and 327,834 seedlings found, and 236,272 bushes and 327,834 seedlings destroyed on second survey.

This makes a grand total of 17,592,224 original bushes, sprouting bushes, and seedlings found, and 17,587,276 original bushes, sprouting bushes and seedlings destroyed, in all three surveys during the entire campaign.

Credit and appreciation are hereby gladly given to State Leaders, Agents, and Collaborators who have supplied data, and to Miss Burnis Benson and Miss Daphne Anderson and others who have aided in the preparation of this report.

FIRST SURVEY, PROPERTIES, January 1 to December 31, 1928

Table 1. Data showing, by States, the number of properties on which barberry bushes were found and destroyed in all surveys, and the number of properties upon which seedlings were found and destroyed in the first and second surveys in the calendar year January 1 to December 31, 1928

State	Number of properties on which : counties :				bushes were found				Total number of proper- : ties cleared of bushes :				Number of properties on which : Seedlings were -				
	: covered in:				: In country :				: Total in				: Destroyed				
	: original :				: In cities: Having :				: cities :				: Found :				
	: survey :				: and towns: escaped: Total :				: and :				: Dug : Treated: Total :				
:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Colorado	0	3	19	27	30	15	15	30	3	0	3	3	3	3	3	3	3
Illinois	3.00	35	59	85	120	49	71	120	17	14	3	17	14	3	3	17	17
Indiana	0	42	60	93	135	65	70	135	13	5	8	13	5	8	13	13	13
Iowa	0	28	68	87	115	20	95	115	6	0	6	6	0	6	6	6	6
Michigan	0.62	67	101	116	183	149	108	257	41	11	30	41	11	30	41	41	41
Minnesota	0	16	91	120	136	44	92	136	53	9	44	53	9	44	53	53	53
Montana	6.30	12	0	4	16	13	5	18	3	2	0	3	2	0	2	2	2
Nebraska	-	12	22	32	44	6	38	44	8	7	1	8	7	1	8	8	8
North Dakota	-	5	1	8	13	1	12	13	3	0	3	3	0	3	3	3	3
Ohio	0.61	65	217	274	339	108	248	356	100	7	93	100	7	93	100	100	100
South Dakota	-	9	27	27	36	11	25	36	5	4	1	5	4	1	5	5	5
Wisconsin	-	45	76	84	129	28	101	129	41	11	31	41	11	31	42	42	42
Wyoming	0	3	0	3	6	0	6	6	0	0	0	0	0	0	0	0	0
Totals	10.53	342	741	960	1,302	509	886	1,395	293	70	223	293	70	223	293	293	293

Table 2. Data showing, by States, the number of barberry bushes found and destroyed in all surveys, and the number of seedlings found and destroyed in first and second surveys in the calendar year January 1 to December 31, 1928

Totals	2,410	106,297	109,054	111,464	3,662	108,418	112,080	1,403,830	17,238	1,386,992	1,404,230
--------	-------	---------	---------	---------	-------	---------	---------	-----------	--------	-----------	-----------

FIRST SURVEY, PROPERTIES, April 1, 1918, to December 31, 1928

Table 3. Data showing, by States, the number of properties on which barberry bushes were found and destroyed in all surveys, and the number of properties upon which seedlings were found and destroyed in first and second surveys, from April 1, 1918, to December 31, 1928

:Number of : Number of properties on which : Total number of proper--: Number of properties on which												
: counties	:	: bushes found--	:	: Total in:	:	: ties cleared of bushes	:	: seedlings were--	:	:	:	:
: covered by:	:	: In country	:	: cities &	:	: Dug	:	: Destroyed	:	:	:	:
: original	: In country	: Having	: Total	: country	:	: Dug	: Treated	: Found:	:	: Dug	: Treated:	: Total
: survey	: and escapes	: bushes	:	:	:	:	:	:	:	:	:	:
State	:	:	:	:	:	:	:	:	:	:	:	:
Colorado	31.49	1,575	111	238	1,313	1,670	140	1,810	113	19	94	113
Illinois	30.00	11,242	1,542	2,649	14,911	12,912	1,999	14,911	353	270	83	353
Indiana	32.00	3,755	453	1,465	5,220	4,607	610	5,217	141	64	77	141
Iowa	99.00	7,182	1,029	5,115	10,297	9,157	1,138	10,295	385	157	228	385
Michigan	65.71	5,242	2,280	6,123	11,370	9,453	1,917	11,370	849	558	291	849
Minnesota	37.00	3,204	675	2,284	5,488	4,996	492	5,488	532	404	128	532
Montana	55.00	239	52	147	336	314	70	384	40	33	6	39
Nebraska	93.00	3,232	196	926	4,158	3,702	456	4,158	85	43	42	85
North Dakota	53.00	563	1	378	946	777	169	946	15	1	14	15
Ohio	37.75	7,937	1,465	3,632	11,639	9,972	1,665	11,637	1,020	476	544	1,020
South Dakota	69.00	522	137	758	1,280	835	445	1,280	106	91	15	106
Wisconsin	71.00	7,150	1,750	3,555	10,655	9,129	1,439	10,618	564	288	269	557
Wyoming	8.12	28	1	18	96	86	8	94	7	7	0	7
Totals	892.07	51,896	9,741	26,363	73,259	67,610	10,598	78,208	4,210	2,411	1,791	4,202

Table 4. Data showing, by States, the number of barberry bushes found and destroyed in all surveys, and the number of seedlings found and destroyed in first and second surveys, from April 1, 1918, to December 31, 1928

Totals	2,137,941	4,463,049	4,886,392	7,024,333	6,038,731	983,802	7,022,533	10,250,666	2,333,836	7,913,944	10,247,780
--------	-----------	-----------	-----------	-----------	-----------	---------	-----------	------------	-----------	-----------	------------

Table 5. Data showing, by States, the number of properties on which barberry bushes and seedlings were found and destroyed on second survey in the barberry-eradication campaign in the calendar year January 1 to December 31, 1928

State	Number of:--	Number of properties on which	Total number of proper--	Number of properties on which								
	counties :	bushes were found--	ties cleared of bushes :	seedlings were--								
	surveyed :	In country :	cities & :	Destroyed :								
	and towns:escaped:	Total :	Dug :	Found :								
	:	bushes :	:	Dug :								
	:	:	:	Treated:								
	:	:	:	Total :								
Colorado	1.60	3	18	26	29	15	14	29	3	0	3	3
Illinois	2.023	24	55	65	89	25	64	89	10	8	2	10
Indiana	0.05	17	35	55	72	31	41	72	9	2	7	9
Iowa	0.31	18	56	71	89	8	81	89	13	1	12	13
Michigan	0.58	12	2	5	17	13	4	17	3	3	0	3
Minnesota	1.07	13	57	85	98	39	59	98	41	7	34	41
Montana	0.02	0	8	9	9	0	9	9	3	2	1	3
Nebraska	3.75	11	20	29	40	5	35	40	7	6	1	7
North Dakota	3.00	5	0	3	8	0	8	8	0	0	0	0
Ohio	0.16	0	0	0	0	0	0	0	0	0	0	0
South Dakota	1.20	6	4	10	16	7	9	16	1	1	0	1
Wisconsin	0.15	45	70	77	122	27	95	122	37	10	27	37
Wyoming	1.00	3	0	3	6	0	6	6	0	0	0	0
Totals	14.913	157	325	438	595	170	425	595	127	40	87	127

SECOND SURVEY, BUSHES AND SEEDLINGS, January 1 to December 31, 1928

Table 6. Data showing, by States, the number of barberry bushes and seedlings found and destroyed on second survey in the barberry-eradication campaign in the calendar year January 1 to December 31, 1928

State	Number of bushes found--				Number of bushes destroyed:				Number of seedlings--			
	In cities:		In country:		Total	Dug		Total	Found	Destroyed		Total
	and towns:	Escaped:	Total	Total		Total	Treated			Dug	Treated	
Colorado	3	103	121	124	37	87		124	64	0	64	64
Illinois	103	792	814	917	86	831		917	7,872	7,721	151	7,872
Indiana	27	1,656	1,707	1,734	55	1,679		1,734	3,266	101	3,165	3,266
Iowa	95	1,177	1,551	1,646	12	1,634		1,646	485	50	435	485
Michigan	31	13	26	57	39	18		57	60	60	0	60
Minnesota	290	2,673	2,914	3,204	374	2,830		3,204	1,436	27	1,409	1,436
Montana	0	323	328	328	0	328		328	1,500	500	1,000	1,500
Nebraska	23	450	525	548	39	509		548	1,026	835	141	1,026
North Dakota	30	0	30	60	0	60		60	0	0	0	0
Ohio	0	0	0	0	0	0		0	0	0	0	0
South Dakota	99	10	118	217	84	133		217	3	3	0	3
Wisconsin	96	39,201	39,274	39,370	120	39,250		39,370	28,043	390	27,653	28,043
Wyoming	4	0	8	12	0	12		12	0	0	0	0
Totals	801	46,398	47,416	48,217	846	47,371		48,217	43,755	9,737	34,018	43,755

SECOND SURVEY, BUSHES AND SEEDLINGS, January 1, 1922, to December 31, 1928

Table 8. Data showing, by States, the number of barberry bushes and seedlings found and destroyed on second survey in the barberry-eradication campaign from January 1, 1922, to December 31, 1928

State	Number of bushes found--				Number of bushes destroyed:				Number of seedlings--			
	In cities:		In country:		Dug	Treated	Total	Found	Destroyed		Dug	Treated
	Escaped	Total	Escaped	Total								
Colorado	109	559	642	751	53	698	751	4,420	0	4,420	4,420	4,420
Illinois	2,989	96,465	98,008	100,997	22,450	78,547	100,997	51,693	41,423	10,270	51,693	51,693
Indiana	704	1,867	2,202	2,906	773	2,130	2,903	6,472	2,048	4,424	6,472	6,472
Iowa	656	6,072	9,990	10,646	1,138	9,506	10,644	116,511	4,079	112,432	116,511	116,511
Michigan	130	681	796	926	314	612	926	1,045	995	50	1,045	1,045
Minnesota	760	4,740	7,829	8,589	2,141	6,448	8,589	5,364	661	4,703	5,364	5,364
Montana	2	400	410	412	74	337	411	1,529	529	1,000	1,529	1,529
Nebraska	545	3,497	6,255	6,800	1,531	5,269	6,800	8,342	4,946	3,396	8,342	8,342
North Dakota	267	0	1,826	2,093	343	1,750	2,093	40	0	40	40	40
Ohio	59	0	31	90	88	2	90	0	0	0	0	0
South Dakota	478	330	2,010	2,488	410	2,078	2,488	1,392	1,129	263	1,392	1,392
Wisconsin	941	97,681	98,593	99,534	18,345	81,189	99,534	131,026	47,900	83,126	131,026	131,026
Wyoming	5	0	41	46	1	45	46	0	0	0	0	0
Totals	7,645	212,342	228,633	236,278	47,661	188,611	236,272	327,834	103,710	224,124	327,834	327,834

RESURVEY, PROPERTIES, January 1 to December 31, 1928

Table 9. Data showing, by States, the number of properties on which sprouting bushes and seedlings were found and destroyed on resurvey in the barberry-eradication campaign in the calendar year January 1 to December 31, 1928

State	Number of properties on which sprouting bushes were found--		Total number of properties : cleared of sprouting bushes:		Number of properties on which seedlings were--					
	In cities:	In country:	Total in : cities & :	Dug :	Treated :	Found :	Destroyed :	Dug :	Treated :	Total :
Colorado	1	0	1	0	1	3	0	3	3	3
Illinois	2	5	7	2	5	4	1	3	3	4
Indiana	1	4	5	1	4	0	0	0	0	0
Iowa	6	12	18	1	17	12	1	11	11	12
Michigan	0	2	2	0	2	0	0	0	0	0
Minnesota	14	48	105	32	73	19	1	18	18	19
Montana	1	0	1	0	1	0	0	0	0	0
Nebraska	3	5	12	3	9	3	2	1	1	3
North Dakota	3	0	3	1	7	0	0	0	0	0
Ohio	0	0	0	0	0	0	0	0	0	0
South Dakota	0	4	8	0	8	5	4	1	1	5
Wisconsin	8	15	28	4	24	20	1	19	19	20
Wyoming	0	0	0	0	0	0	0	0	0	0
Totals	39	89	195	44	151	66	10	56	56	66

RESURVEY, SPROUTING BUSHES AND SEEDLINGS, January 1 to December 31, 1928

Table 10. Data showing, by States, the number of sprouting bushes and seedlings found and destroyed on resurvey in the barberry-eradication campaign in the calendar year January 1 to December 31, 1928

State	: Number of sprouting bushes found--:			: Number of sprouting bushes destroyed:			: Number of seedlings--:		
	: In cities:	: In country :		: Total:	: Dug :	: Treated :	: Total :	: Found :	: Destroyed :
	: and towns:	Escaped:	Total:	Total:	Dug			Dug	: Treated: Total
Colorado	2	0	0	2	0	2	2	406	0 406
Illinois	3	23	27	30	3	27	30	127	8 119
Indiana	4	8	12	16	4	12	16	0	0 0
Iowa	490	1,129	1,191	1,681	2	1,679	1,681	1,748	8 1,740
Michigan	0	920	920	920	0	920	920	0	0 0
Minnesota	77	757	1,123	1,200	133	1,067	1,200	362	2 360
Montana	60	0	0	60	0	60	60	0	0 0
Nebraska	19	24	68	87	12	75	87	372	297 75
North Dakota	14	0	61	75	6	69	75	0	0 0
Ohio	0	0	0	0	0	0	0	0	0 0
South Dakota	0	13	48	48	0	48	48	630	621 9
Wisconsin	12	267	391	403	7	396	403	23,275	100 23,175
Wyoming	0	0	0	0	0	0	0	0	0 0
Totals	681	3,141	3,841	4,522	167	4,355	4,522	26,920	1,036 25,884
									26,920

RESURVEY, PROPERTIES, April 1, 1918, to December 31, 1928

Table 11. Data showing, by States, the number of properties on which sprouting bushes and seedlings were found and destroyed on resurvey in the barberry-eradication campaign from April 1, 1918, to December 31, 1928

State	: Number of properties on which sprout--: Total number of properties : Number of properties on which									
	: ing bushes were found--: cleared of sprouting bushes:					seedlings were--				
	: In country		: Total in		: cities &		: Dug		: Destroyed	
	: In cities:	: Having :	: Total :	: country :	: Dug :	: Treated:	: Total :	: Found :	: Dug :	: Treated :
	: and towns:	: escaped :	: Total :	: country :	: Dug :	: Treated:	: Total :	: Found :	: Dug :	: Treated :
	: bushes :	:	:	:	:	:	:	:	:	: Total
Colorado	1,445	114	193	1,638	1,418	220	1,638	106	19	37
Illinois	472	474	874	1,346	634	712	1,346	429	345	84
Indiana	184	138	274	458	318	138	456	49	16	33
Iowa	384	391	1,146	1,530	739	791	1,530	294	146	148
Michigan	146	116	291	437	375	62	437	195	191	4
Minnesota	757	689	1,439	2,196	1,684	512	2,196	2,281	2,124	157
Montana	124	6	56	180	163	17	180	23	20	3
Nebraska	219	35	443	662	366	296	662	8	6	2
North Dakota	323	0	251	574	249	325	574	6	0	6
Ohio	1,421	281	1,021	2,442	2,104	338	2,442	716	551	165
South Dakota	341	40	353	694	513	181	694	90	44	46
Wisconsin	921	686	992	1,913	1,354	555	1,909	305	175	130
Wyoming	32	0	10	42	31	7	38	7	7	0
Totals	6,769	2,970	7,343	14,112	9,948	4,154	14,102	4,509	3,644	865
										4,509

RESURVEY, SPROUTING BUSHES AND SEEDLINGS, April 1, 1918, to December 31, 1928

Table 12. Data showing, by States, the number of sprouting bushes and seedlings found and destroyed on resurvey in the barberry-eradication campaign from April 1, 1918, to December 31, 1928

State	Number of sprouting bushes found--			Number of seedlings--							
	In country			In cities							
	Escaped	Total	Destroyed	Found	Treated	Destroyed					
Colorado	3,837	2,023	3,160	6,997	5,156	1,841	6,997	4,328	712	3,616	4,328
Illinois	5,048	8,558	17,575	22,623	10,408	12,215	22,623	581,777	405,392	176,385	581,777
Indiana	1,569	16,379	18,328	19,897	17,942	1,953	19,895	5,494	847	4,647	5,494
Iowa	4,634	11,120	27,988	32,622	15,917	16,705	32,622	59,771	28,843	30,928	59,771
Michigan	524	2,114	3,338	3,862	2,231	1,631	3,862	607,869	547,784	60,085	607,869
Minnesota	14,129	18,348	38,197	52,326	40,879	11,447	52,326	28,778	4,435	24,293	28,778
Montana	3,617	5	1,647	5,264	5,070	194	5,264	1,069	399	670	1,069
Nebraska	6,253	282	10,621	16,879	12,576	4,303	16,879	841	729	113	841
North Dakota	1,017	0	1,466	2,483	315	2,168	2,483	100	0	100	100
Ohio	5,666	8,046	12,276	17,942	13,071	4,871	17,942	362,585	111,527	251,058	362,585
South Dakota	20,980	5,317	22,170	43,150	36,630	6,520	43,150	10,125	7,438	2,687	10,125
Wisconsin	11,256	76,258	81,349	92,605	19,472	72,952	92,424	1,344,113	139,561	1,204,552	1,344,113
Wyoming	546	0	29	575	475	21	496	53	53	0	53
Totals	79,081	148,950	238,144	317,225	180,142	136,821	316,963	3,006,903	1,247,769	1,759,134	3,006,903

ERADICATION, 1928

Table 13. Data showing, by States, the number of original bushes, sprouting bushes, and seedlings dug and treated, and the total number destroyed by both methods, from January 1 to December 31, 1928

State	Original Bushes			Sprouting Bushes			Seedlings			Totals		
	Dug	Treated	Total	Dug	Treated	Total	Dug	Treated	Total	Dug	Treated	Total
Colorado	89	203	292	0	2	2	0	0	0	39	7,257	7,346
Illinois	144	887	1,031	3	27	30	8,366	7,052	8,567	8,513	1,115	9,628
Indiana	186	2,533	2,724	4	12	16	129	3,413	3,547	319	5,968	6,287
Iowa	107	3,851	3,958	2	1,679	1,681	0	420	420	109	5,950	6,059
Michigan	1,354	41,656	43,010	0	920	920	360	1,161,547	1,161,907	1,714	1,204,123	1,205,837
Minnesota	390	6,977	7,367	133	1,067	1,200	45	2,852	2,897	568	10,896	11,464
Montana	292	18	310	0	60	60	665	0	665	957	78	1,035
Nebraska	239	535	774	12	75	87	887	141	1,028	1,132	751	1,889
North Dakota	13	158	171	6	69	75	0	530	530	19	757	776
Ohio	617	11,764	12,381	0	0	0	5,185	182,800	187,985	5,802	194,564	200,366
South Dakota	105	312	417	0	48	48	767	17	784	872	377	1,249
Wisconsin	126	39,507	39,633	7	396	403	834	28,014	28,848	967	67,917	68,884
Wyoming	0	12	12	0	0	0	0	0	0	0	12	12
Totals	3,662	108,418	112,080	167	4,355	4,522	17,238	1,386,992	1,404,230	21,067	1,499,765	1,520,832

ERADICATION, 1918 to 1928

Table 14. Data showing, by States, the number of original bushes, sprouting bushes, and seedlings dug and treated, and the total number destroyed by both methods from April 1, 1918, to December 31, 1928

State	Original Bushes			Sprouting Bushes			Seedlings			Totals		
	Dug	Treated	Total	Dug	Treated	Total	Dug	Treated	Total	Dug	Treated	Total
Colo.	24,009	1,459	25,468	5,156	1,841	6,997	712	14,368	15,080	29,877	17,698	47,575
Ill.	198,803	187,800	386,603	10,403	12,215	22,623	472,166	1,703,694	2,175,860	681,382	1,903,709	2,585,091
Ind.	99,313	100,877	200,190	17,942	1,953	19,895	3,605	18,710	22,315	120,860	121,540	242,400
Iowa	774,639	38,666	813,355	15,917	16,705	32,622	32,367	155,169	187,536	822,973	210,540	1,033,513
Mich.	380,535	329,576	710,111	2,231	1,631	3,862	1,445,482	3,038,015	4,483,497	1,828,248	3,369,222	5,197,470
Minn.	781,274	16,603	797,877	40,879	11,447	52,326	25,465	34,268	59,733	847,618	62,318	909,936
Mont.	10,777	1,484	12,261	5,070	194	5,264	17,124	2,764	19,888	32,971	4,442	37,413
Nebr.	91,661	7,538	99,199	12,576	4,303	16,879	6,196	10,460	16,656	110,433	22,301	132,734
N. Dak.	19,916	3,482	23,398	315	2,168	2,483	150	673	823	20,381	6,323	26,704
Ohio	251,262	152,310	403,572	13,071	4,871	17,942	129,720	1,686,127	1,815,848	394,053	1,843,309	2,237,362
S. Dak.	49,205	12,103	61,308	36,630	6,520	43,150	24,879	3,637	28,516	110,714	22,260	132,974
Wis.	3,353,310	131,827	3,485,137	19,472	72,952	92,424	175,917	1,246,058	1,421,975	3,548,699	1,450,837	4,999,536
Wyo.	3,972	47	4,019	475	21	496	53	0	53	4,500	68	4,568

Totals

6,038,731 983,802 7,022,533 180,142 136,821 316,963 2,333,836 7,913,944 10,247,780 8,552,709 9,034,567 17,587,276

CHEMICALS, QUANTITIES USED, January 1 to December 31, 1928

Table 15. Data showing, by States, quantities of chemicals used in the barberry-eradication campaign from January 1 to December 31, 1928

State	Salt (Tons)		Sodium Arsenite (Gals.)		Kerosene (Gallons)	
	Furnished by--		Furnished by--		Furnished by--	
	Property:	State	Conference:	Total	Conference:	Total
	owner	agency	P.G. Rust	U.S.D.A.:	P.G. Rust	U.S.D.A.:
Colorado	0	0	0	0.780	0	0.780
Illinois	0	2.037	0	11.560	0	11.560
Indiana	0	0	0	6.694	0	6.694
Iowa	0.01	0	0	32.510	0	32.510
Michigan	0	0	0	68.100	0	68.100
Minnesota	0.03	0	0	24.560	0	24.560
Montana	0	0	0	1.910	0	1.910
Nebraska	0	0	0	0.490	0	0.490
North Dakota	1.45	0	0	0.350	0	0.350
Ohio	0	79.970	0	79.970	0	79.970
South Dakota	0.08	0	0	2.720	0	2.720
Wisconsin	0	94.850	0	3.000	0	3.000
Wyoming	0	0	0	0.120	0	0.120
Totals	1.57	176.857	0	152.794	0	152.794
				331.221	0	331.221
					14.00	1,345.65
						1,359.65

*Furnished by State

CHEMICALS, QUANTITIES USED, September 1, 1921, to December 31, 1923

Table 16. Data showing, by States, quantities of chemicals used in the barberry-eradication campaign from September 1, 1921, to December 31, 1923

State	Salt (Tons)		Sodium Arsenite (Gals.)		Kerosene (Gallons)	
	Furnished by--		Furnished by--		Furnished by--	
	Property: State	Confer-: U.S.D.A.:	Confer-: U.S.D.A.:	Owner : U.S.D.A. :	Total	Total
	owner : agency	G. Rust:	G. Rust:	G. Rust:		
Colorado	0	0	7.920	0	0	30.000
Illinois	0.750	57.817	333.050	477.617	0	124.000
Indiana	0.825	0	66.890	67.715	0	265.000
Iowa	44.200	0	20.69	229.640	0	692.500
Michigan	0.030	0	8.49	503.400	175.60	11,341.000
Minnesota	3.110	0.340	68.340	82.000	0	43.650 ^{b/}
Montana	0.120	0	7.430	7.600	0	30.000
Nebraska	0.156	0	8.55	28.786	0	4,595.000
North Dakota	18.530	5.000	20.030	29.010	0	151.50
Ohio	3.040	350.770	5.430	873.050	16.20	1,701.000 ^{a/}
South Dakota	14.470	0	24.240	47.970	30.10	0
Wisconsin	0.250	347.323	15.650	446.566	0	22.000
Wyoming	0.050	0	23.738	403.00	190.00	0.375 ^{c/}
			0.230	0	0	0
Totals	85.531	1,262.255	165.79	599.80	456.65	13,994.525
						24,653.27

a/ 4,925 gallons furnished by State
b/ 10 gallons of drip oil
c/ Carbon bisulphide

GRAND SUMMARY, ORIGINAL BUSHES, SPROUTING BUSHES, AND SEEDLINGS, January 1 to December 31, 1923

Table 17. Data showing, by States, the number of bushes, sprouting bushes, and seedlings found and destroyed in all surveys in the barberry-eradication campaign, from January 1 to December 31, 1923

State	Original bushes		Sprouting bushes		Seedlings		Grand Total	
	Found	Destroyed	Found	Destroyed	Found	Destroyed	Found	Destroyed
Colorado	292	292	2	2	7,052	7,052	7,346	7,346
Illinois	1,031	1,031	30	30	8,567	8,567	9,628	9,628
Indiana	2,724	2,724	16	16	3,547	3,547	6,287	6,287
Iowa	3,958	3,958	1,681	1,681	420	420	6,059	6,059
Michigan	42,104	43,010	920	920	1,161,907	1,161,907	1,204,931	1,205,837
Minnesota	7,367	7,367	1,200	1,200	2,897	2,897	11,464	11,464
Montana	311	310	60	60	765	665	1,136	1,035
Nebraska	774	774	87	87	1,028	1,028	1,889	1,889
North Dakota	171	171	75	75	530	530	776	776
Ohio	12,670	12,381	0	0	187,985	187,985	200,655	200,366
South Dakota	417	417	48	48	784	784	1,249	1,249
Wisconsin	39,633	39,633	403	403	28,348	28,848	68,384	68,884
Wyoming	12	12	0	0	0	0	12	12
Totals	111,464	112,080	4,522	4,522	1,403,830	1,404,230	1,519,816	1,520,832

GRAND SUMMARY, ORIGINAL BUSHES, SPROUTING BUSHES, AND SEEDLINGS, 1918-1928

Table 18. Data showing, by States, the number of bushes, sprouting bushes, and seedlings found and destroyed in all surveys in the barberry-eradication campaign, from April 1, 1918, to December 31, 1928

State	Original bushes		Sprouting bushes		Seedlings		Grand Total	
	Found	Destroyed	Found	Destroyed	Found	Destroyed	Found	Destroyed
Colorado	25,502	25,498	6,997	6,997	15,080	15,080	47,579	47,575
Illinois	386,608	386,608	22,623	22,623	2,175,860	2,175,860	2,585,091	2,585,091
Indiana	200,196	200,190	19,897	19,895	22,315	22,315	242,408	242,400
Iowa	813,361	813,355	32,622	32,622	187,536	187,536	1,033,519	1,033,513
Michigan	710,111	710,111	3,862	3,862	4,483,497	4,483,497	5,197,470	5,197,470
Minnesota	797,877	797,877	52,326	52,326	59,733	59,733	909,936	909,936
Montana	12,273	12,261	5,264	5,264	19,988	19,988	37,525	37,413
Nebraska	99,199	99,199	16,879	16,879	16,656	16,656	132,734	132,734
North Dakota	23,398	23,398	2,483	2,483	823	823	26,704	26,704
Ohio	404,583	403,572	17,942	17,942	1,815,848	1,815,848	2,238,373	2,237,362
South Dakota	61,308	61,308	43,150	43,150	28,516	28,516	132,974	132,974
Wisconsin	3,485,729	3,485,137	92,605	92,424	1,424,761	1,421,975	5,003,095	4,999,536
Wyoming	4,188	4,019	575	496	53	53	4,816	4,568
Totals	7,024,333	7,022,533	317,225	316,963	10,250,666	10,247,780	17,592,224	17,587,276

GRAND SUMMARY BY YEARS, ORIGINAL BUSHES, SPROUTING BUSHES, AND SEEDLINGS, 1918 to 1928

Table 19. Data showing, by calendar years, the total numbers of original bushes, sprouting bushes, and seedlings found and destroyed in all surveys in the barberry-eradication campaign, from April 1, 1918, to December 31, 1928

Year	Original bushes		Sprouting bushes		Seedlings		Totals	
	Found	Destroyed	Found	Destroyed	Found	Destroyed	Found	Destroyed
1918	1,842,239	1,690,475	1,996	1,996	500	500	1,844,735	1,692,971
1919	2,096,063	2,025,389	17,874	17,874	3,500	3,500	2,117,437	2,046,763
1920	1,506,007	518,315	33,148	33,148	1,500	1,500	1,540,655	552,960
1921	175,662	209,647	27,697	27,697	18,557	18,557	221,916	255,901
1922	209,397	729,721	64,352	64,352	69,733	69,733	343,482	863,337
1923	233,161	251,013	106,700	106,145	3,665,581	3,610,681	4,005,442	3,967,839
1924	295,814	388,632	21,852	21,850	847,771	844,485	1,165,437	1,254,961
1925	142,550	149,822	17,036	17,141	701,796	754,505	861,382	921,468
1926	204,530	723,580	16,149	16,504	2,062,689	2,064,805	2,283,368	2,304,889
1927	207,446	223,859	5,899	6,203	1,475,209	1,475,284	1,688,554	1,705,346
1928	111,464	112,080	4,522	4,522	1,403,830	1,404,230	1,519,816	1,520,850
Totals	7,024,333	7,022,533	317,225	316,963	10,250,666	10,247,780	17,592,224	17,537,276